BRIEF REPORT

Economic effect of a smoke-free law in a tobacco-growing community

Mark K Pyles, Donald J Mullineaux, Chizimuzo T C Okoli, Ellen J Hahn

Tobacco Control 2007;**16**:66–68. doi: 10.1136/tc.2006.017012

Objective: To determine whether Lexington, Kentucky's smoke-free law affected employment and business closures in restaurants and bars. On 27 April 2004, Lexington-Fayette County implemented a comprehensive ordinance prohibiting smoking in all public buildings, including bars and restaurants. Lexington is located in a major tobacco-growing state that has the highest smoking rate in the US and was the first Kentucky community to become smoke-free.

Design: A fixed-effects time series design to estimate the effect of the smoke-free law on employment and ordinary least squares to estimate the effect on business openings and closings.

Subjects and settings: All restaurants and bars in Lexington-Fayette County, Kentucky and the six contiguous counties.

Main outcome measures: ES-202 employment data from the Kentucky Workforce Cabinet; Business opening/closings data from the Lexington-Fayette County Health Department, Environmental Division.

Results: A positive and significant relationship was observed between the smoke-free legislation and restaurant employment, but no significant relationship was observed with bar employment. No relationship was observed between the law's implementation and employment in contiguous counties nor between the smoke-free law and business openings or closures in alcohol-serving and or non-alcohol-serving businesses.

Conclusions: No important economic harm stemmed from the smoke-free legislation over the period studied, despite the fact that Lexington is located in a tobacco-producing state with higher-than-average smoking rates.

Many studies have shown that smoke-free laws implemented in US cities are not harmful to business activity. For example, one paper shows that New York City's 1995 Smoke-Free Air Act had no adverse effects on restaurant employment growth, which instead was three times higher than the rest of the state from 1993 to 1997.[1] Another study examined sales tax receipts in 15 cities with and without ordinances banning smoking in restaurants from 1986 to 1993, and found that smoke-free ordinances did not negatively affect restaurant sales.[2] Similarly, Sciacca and Eckrem[3] found that gross restaurant sales in Flagstaff, Arizona, increased between 16% and 25.8% per business 1 year after a smoke-free ordinance was implemented. Other studies focused on bar and tourism receipts have shown no adverse effects of smoking ordinances on revenues.[4–6] A recent study of the El Paso, Texas, US smoke-free ordinance, the strongest smoke-free law in that state, found no changes in restaurant or bar revenues on the basis of a comparison of sales tax and mixed-beverage tax data over the 12 years preceding and 1 year after the law was implemented.[7] Scollo and Lal[8] and Scollo *et al*,[9] provide a comprehensive review of this literature.

On 27 April, 2004, after an unsuccessful legal challenge, Lexington-Fayette County, Kentucky, implemented a 100% smoke-free ordinance, prohibiting smoking in all public buildings, including restaurants, bars, bowling alleys and other businesses. Currently, about 37% of the US population is protected by local or state-wide smoke-free laws.[10] However, tobacco-growing states typically have weak tobacco control laws and provide less public protection from secondhand smoke.[11] Lexington-Fayette County was the first community in Kentucky, a national leader in burley tobacco production[12] and cigarette smoking,[13] to enact such legislation. The purpose of our study is to determine whether the smoke-free law affected: (1) employment in restaurants and bars in either Lexington-Fayette or its contiguous counties or (2) the rate of business closures in food and drinking establishments in Lexington-Fayette County.

METHODS

We use a time-series framework to examine the relationship between the smoke-free legislation and employment in restaurants and bars. Specifically, we estimate fixed effects models. Bartosch and Pope[14] used this technique to examine the effects of smoking restrictions in Massachusetts, and the same methods have been used in studies focused on the economic implications of other phenomena, such as poverty (eg, Roberts[15]) or education (eg, Lin and Chen[16]), that may vary geographically.

We obtained employment data from the ES-202 database, produced by the Kentucky Workforce Cabinet, for the 64 months before and 14 months after the law took effect for each county in Kentucky. Population data were obtained from the Census Bureau and unemployment data from the Local Area Unemployment Statistics database, maintained by the Bureau of Labor Statistics, but produced by the states. We gathered data on monthly business openings and closings in food and drinking establishments in Lexington-Fayette County from the Lexington-Fayette County Health Department, Environmental Division, for the 46 months before and 19 months after the law took effect.

RESULTS

Employment

We initially examined whether average employment differed in the periods before and after the smoke-free law was implemented. We found that mean employment was considerably higher in restaurants (by 3.4%), but unchanged at bars. A simple comparison of means ignores the potential effect of factors other than the legislation on employment, such as changes in unemployment or population. To more accurately estimate the effect of the smoke-free law on employment levels in Lexington and surrounding counties, we estimated the following fixed effects model:

$$Emp_{i,t} = \beta_0 + \beta_{County} + \beta_1 FayetteBanDum_{i,t} + \beta_2 Unemployment_{i,t} + \beta_3 Population_{i,t} + \beta_{year} + \beta_{month} \quad (1)$$

Table 1 Fixed effects results for employment by county

	Restaurants		Bars	
	Coef	p Value	Coef	p Value
Intercept	189.84	0.002	306.49	0.000
FayetteBanDum	401.34	0.000	10.05	0.418
Unemployment	1.92	0.072	1.35	0.153
Population	0.02	0.00	0.00	0.00
F value	41.27		5.32	
Prob >F	0.00		0.00	

Coef, coefficient.
This table presents results from a fixed effects model with county varying intercepts. The dependent variable is the number of monthly employees in each respective county for each sample month. FayetteBanDum is a dummy variable equal to 1 for Fayette county-months from May 2004 to June 2005, 0 otherwise. Year and Month dummy variables are excluded for brevity.

where i denotes the county and t denotes the month. Each observation of the dependent variable captures the total number of employees working in restaurants or bars in a given county each month. Table 1 presents the results

FayetteBanDum is a dummy variable equal to 1 for Lexington-Fayette county-months from May 2004 to June 2005, and 0 otherwise. The sign and significance of this coefficient measures the impact of the smoke-free legislation on employment. β_0 is a global intercept, while $\beta_{Country}$ (not reported) is a vector of dummy variables, so that each county has a unique indicator. This allows us to control for county-specific effects that may influence the results. β_{year} and β_{month} are vectors of dummy variables for each year and month, respectively. These variables take account of any broad macroeconomic and seasonal factors that may affect employment. The year 1999 and the month of January are treated as referent observations. The numerical values for the month or year dummies are not reported here for the sake of conciseness.

After controlling for seasonality and county effects, there is a statistically positive relationship between the smoke-free legislation and restaurant employment. The coefficient of 401.34 implies an average increase of around 400 employees per month subsequent to the smoke-free law, which is approximately 3% of total restaurant employment in the county. This is consistent with our univariate findings. In the case of bars, we fail to reject the hypothesis that the smoking legislation did not affect bar employment in Lexington-Fayette County. We also examined the effects of the smoke-free law on restaurant and bar employment in the six counties contiguous to Lexington-Fayette, but found no significant effect in any case. For the sake of brevity, we omit these results.

Openings and closures

A comparison of the mean rates of openings and closures before and after the legislation shows no significant differences at either type of establishment, as reflected in t-statistics calculated assuming unequal variances. However, to gauge more precisely the effect of the legislation, we estimate the following model for openings and closures by month before and after the smoke-free legislation:

$$\text{Percent} = \beta_0 + \beta_1\text{BanDum} + \beta_2\text{Employed} + \beta_{month} + \beta_{year} \quad (2)$$

where the dependent variable Percent is either PercentOpen or PercentClose. PercentOpen is the ratio of monthly openings to total business establishments at the end of the relevant month and PercentClose is similarly defined. BanDum is a dummy variable that equals 1 for Lexington-Fayette county-months from May 2004 to November 2005, and 0 otherwise.

If the smoke-free law had a negative affect on the number of establishments, we should find a positive relationship between BanDum and PercentClose and a negative relationship between BanDum and PercentOpen. Employed is the monthly number of employed individuals in Lexington-Fayette County and takes account of changes in economic activity at the county level. β_{year} and β_{month} are vectors of dummy variables for each year and month, respectively, and serve roles similar to those in the models for employment. We found no relationship between BanDum and either openings or closings in either the total sample or in subsamples of establishments serving and not serving alcohol while space does not permit presentation of the results.

DISCUSSION

Although there are many studies of the economic effects of smoke-free legislation, our paper adds to the literature by focusing on a local economy that, unlike most others studied, depends heavily on tobacco as a source of income and where smoking rates substantially exceed the national average. As the effect of this type of legislation can depend on the mix of smokers and non-smokers in the relevant economy, we might anticipate that the economic effects would be more negative in a locale where smoking is more prevalent.[17] Our study may serve as a pivotal piece of information to lawmakers considering similar legislation in other tobacco-dependent communities. As we use statistical methods that control for systematic differences across counties, we can more accurately and confidently identify any quantitative effects of the legislation on local employment.

The findings of this study are important for smoke-free efforts in locales inside and outside the US that have high smoking rates. They are consistent with other studies of the economic effect of smoke-free laws that find no negative economic influences from such legislation.

What this paper adds

- Previous studies have found that smoke-free legislation does not bring economic harm to local communities.
- Our contribution is to focus on a geographical area where tobacco production is an important component of economic activity and where tobacco consumption is above average.
- We again found there is no negative economic impact from the legislation, even in an economy where the legislative effects could be expected to differ from those reported in other studies.
- We used econometric techniques that are more robust than those employed in the many similar studies.

ACKNOWLEDGEMENTS

We thank the Center for Business and Economic Research at the University of Kentucky Gatton College of Business and Economics for access to the ES-202 data set. We also thank the Lexington-Fayette County Health Department for data on business openings and closures.

Authors' affiliations

Mark K Pyles, School of Business and Economics, College of Charleston, Charleston, South Carolina, USA
Donald J Mullineaux, School of Management, Gatton College of Business and Economics, University of Lexington, Kentucky, USA
Chizimuzo T C Okoli, Lexus Group, University of British Columbia, British Columbia, Canada
Ellen J Hahn, University of Kentucky, College of Nursing and College of Public Health, Lexington, Keutucky, USA

Funding: This study was funded by the University of Kentucky Research Program.

Competing interests: None declared.

Correspondence to: Dr M Pyles, School of Business and Economics, College of Charleston, 5 Liberty Street, Suite 400, Charleston SC 29401, USA; pylesm@cofc.edu

Received 21 April 2006
Accepted 11 September 2006

REFERENCES

1 **Hyland A**, Cummings KM. Restaurant employment before and after the New York City Smoke-Free Air Act. *J Public Health Management Practice* 1999;**5**:22–7.
2 **Glantz SA**, Smith LR. The effect of ordinances requiring smoke-free restaurants on restaurant sales. *Am J Public Health* 1994;**84**:1081–5.
3 **Sciacca J**, Eckrem M. Effects of a city ordinance regulating smoking in restaurants and retail stores. *J Community Health* 1993;**18**:175–82.
4 **Glantz SA**, Charlesworth A. Tourism and hotel revenues before and after passage of smoke-free restaurant ordinances. *JAMA* 1999;**281**:1911–18.
5 **Glantz SA**, Smith LR. The effect of ordinances requiring smoke-free restaurants and bars on revenues: a follow-up. *Am J Public Health* 1997;**87**:1687–93.
6 **Dresser J**, Boles S, Lichetenstein E, *et al*. Multiple impacts of a bar smoking prohibition ordinance in Corvallis, Oregon: Pacifica Research Institute 1999.
7 **Centers for Disease Control and Prevention**. Impact of a smoking ban on restaurant and bar revenues—El Paso, Texas, 2002. *Morb Mortal Wkly Rep* 2004;**53**:150–2.
8 **Scollo M**, Lal A. *Summary of studies assessing the impact of smoking restrictions on the hospitality industry*. Melbourne, Australia: VicHealth Centre for Tobacco Control, 2005.
9 **Scollo M**, Lal A, Hyland A, *et al*. Review of the quality of studies on the economic effects of smoke-free policies on the hospitality industry. *Tob Control* 2003;**12**:13–20.
10 **Americans for Nonsmokers' Rights**. Percent of U.S. state populations covered by local or state 100% smoke-free air laws. 4 October 2005. http://no-smoke.org (Accessed 3 January 2006).
11 **Chaloupka F**, Hahn E, Emery S. Policy levers for the control of tobacco consumption. *Ky Law J* 2002;**90**:1009–42.
12 **US Department of Agriculture**. *Crop production, 2005 summary*. Washington, DC: National Agricultural Statistics Service, 2006, Cr Pr 2–1 (06)..
13 **Centers for Disease Control and Prevention**. State-specific prevalence of current cigarette smoking among adults—United States, 2003. *Morb Mortal Wkly Rep* 2004;**53**:1035–7.
14 **Bartosch W**, Pope G. The effect of smoking restrictions on restaurant businesses in Massachusetts, 1992–1998. *Tob Control* 2002;**11**(Suppl II):ii38–42.
15 **Roberts B**. Area poverty effects on local health care costs: an analysis of Mississippi *Rev Policy Res* 2006;**23**:223–33.
16 **Lin TF**, Chen J. Cumulative class attendance and exam performance. Appl Econ Lett 2006;**13**:937–42.
17 **Cowling DW**, Bond P. Smoke-free laws and bar revenues in California: the last call. Health Econ, 2005;**14**:1273–1281.

The Lighter Side

By permission of Gary Brookins, Richmond Times-Dispatch.